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OXC-1036
Copy 6 of 6

4 November 1960

MEMORANDUM FOR : The Record

SUBJECT : Trip Report - Lockheed Aircraft, Burbank, California, 27 and 28 October 1960

1. Subject facilities were visited by the writer for the purpose of gaining a better understanding of the accelerated flight test program as presented by Mr. C. L. Johnson at the 28 September 1960 Suppliers' Meeting and for a brief review of certain airframe propulsion system components.

2. The accelerated flight test program was discussed on 27 and 28 October with [redacted] The following factors emerged therefrom: 25X1A

(a) Airplanes No. 1 and No. 2 will comprise the fully instrumented test vehicles of the program. Although no firm test plan or schedule has been established so far, tentative thinking schedules No. 1 for airframe stability, performance, and engine performance evaluation. No. 2 is scheduled for evaluation of camera system, inertial navigation and autopilot systems, A. R., and engine performance. [redacted] expresses confidence in realizing 15 hours per month for each airplane barring major engine problems. 25X1A

(b) The accelerated program for airplane No. 3 through 9 will not involve the conventional instrumented flight test concept, rather this will be more an accelerated service test based on refueled mission flights designed to accumulate the hours and experience necessary in order to meet the target date for operation. [redacted] indicated that the accumulation of 40 hours per month per airplane is admittedly ambitious but necessary as a target for planning purposes. To date there exists no firm detail planning or schedule breakdown in support of this program. In order that the necessary spares and support planning be reflective of this program, it is felt that a meeting between Headquarters, Lockheed, Pratt and Whitney, and the other suppliers is in order. 25X1A

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(c) The basic engine delivery schedule, the first part of which has been established, is felt to be compatible with the accelerated program. The several factors which dictate initial engine delivery although still variable have gained some degree of stability. Other factors such as flight test schedules and aircraft layup and inspection schedules, which will affect engine overhaul are still nebulous. Some of these, of course, depend upon test progress and therefore will not become firm until the program is underway.

(d) The accelerated program together with the small number (33) of engines planned in addition to lending austerity in the area of spare engines will very likely result in a critical engine overhaul situation. It appears that from six to ten engines will be required to be in overhaul at the same time. This will exceed the engine contractor's existing capability at the Florida facility. This means either a substantial decrease in the total number of flight hours now planned or an increase in engine overhaul capability such as might be afforded by East Hartford.

25X1A (e) Preliminary planning for [redacted] fuel utilization and for aircraft/engine utilization was discussed. Informal copies representing the writer's thinking were
25X1A transmitted to [redacted] for his comment which was one of concurrence. Planning in the area of tanker operation has not yet been initiated.

3. A tour of the plant facilities revealed the following:

(a) A marked increase in activity relative to June 1960.

(b) A tightly fitting but generally well coordinated engine to nacelle installation mockup.

(c) Hardware for the control bleed section of the inlet.

(d) Fabricated hardware for the trailing edge flap section and partially fabricated hardware for the blow-in door section of the first test ejector.

4. Discussions with [redacted] on 28 October in the area of
25X1A engine/aircraft propulsion involved the following:

(a) Nonstandard day engine performance point data previously transmitted will be summarized by the engine contractor and made a supplement to the recently revised engine specification 3967C. This then will be converted 25X1A into installed aircraft propulsion performance by [redacted] Other than the general performance deterioration on a "hot" day, the major critical airframe propulsion area will be the inlet. Rapid changes in environmental pressure, temperature, density and wind effects, if too fast to be counteracted by the spike control which has a reaction time of about 5 seconds, may well unstart the inlet causing disgorgement of the shock followed by engine flame-out.

(b) The incorporation of the shock trap bleed is felt to have solved the last major problem of inlet design, that of establishing the proper air flow balance between 25X1A inlet, engine and ejector. [redacted] expresses definite satisfaction with current wind tunnel test results reflecting this configuration. A schematic will be forwarded to the writer soon.

(c) A preliminary examination of the revised engine 25X1A spec. 3967C by [redacted] has revealed acceptable changes in bleed correction factors and in ejector performance. The ejector performance changes brought about by the configuration change to accommodate aircraft structure reflect slight losses in the transonic regime which are counterbalanced by gains in both the sub and supersonic 25X1A regimes. No changes in thrust or specific fuel consumption were noted. [redacted] expresses definite satisfaction with the spec. revision based upon his preliminary review.

(d) The ejector and its test instrumentation were discussed. The test rig currently is scheduled for December or January delivery to the engine contractor.

(e) Heat rejection from a windmilling engine remains an outstanding problem. The solution proposed at the 28 September Suppliers' Meeting which involves circulating fuel through the dead engine back to a water boiler in the tank area seems reasonable as far as it goes. In the writer's opinion it may not go quite far enough. Some percentage of engine out conditions will be intentionally initiated by the pilot as corrective action against fire

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or against engine fuel system malfunction conducive to fire. In these instances fuel to the dead engine must be shut off, thus removing the heat sink.

Aside from the fuel shut off condition described above, some "off the record" feeling exists that a fuel-to-air heat exchanger might prove better than the fuel-to-water boiler. The heat exchanger in addition to being lighter and less complex would be operative continuously under all conditions below that ram temperature required for heat exchange whereas the water boiler operation would be limited to approximately 6 minutes by the amount of water on board. The water boiler on the other hand has the advantage of being operative at the high ram temperatures of mission environment thus allowing more time (up to six minutes) for initial deceleration and descent to cooler environment. The evaluation of these factors is currently underway at Lockheed and may require some flight testing before completion. It is [redacted] opinion that the fuel-to-air heat exchanger is a short lead time item and therefore could be phased into the program downstream with relative ease if required. 25X1A

5. A flight test malfunction reporting system has been briefly discussed with both the airframe and engine contractors. [redacted] will submit format samples of this system used during the F-104 program. Pratt and Whitney has submitted a sample copy of their Premature Engine Removal Summary. 25X1A

SIGNED

[redacted] 25X1A
Development Branch
DPD-DD/P

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